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REMARKS

Applicants have considered the outstanding official action. It is respectfully submitted that the claims are directed to patentable subject matter as set forth below.

The drawings are objected to in that Figures 1 and 4 should be labeled "Prior Art" and as failing to comply with 37 CFR 1.84(p)(5) in that the reference sign TW" mentioned in the specification at page 9, line 19, is not shown in the figures and the reference sign TW as shown in Figure 3 is not mentioned in the description. Applicants are submitting herewith proposed corrected Figures 1 and 4 including the legend "PRIOR ART" shown in red. The specification at page 9, lines 16-23, has been amended to insert the reference TW and to read TW''' rather than TW" in order to correspond to the reference sign in Figure 3. Approval of the proposed corrections is requested.

The informalities in the specification noted by the Examiner have been corrected. The description of Figure 1 is based on the specification at page 3, lines 15-18, and page 8, lines 5-8.

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Claims 1-15, 21, and 22-25 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite as to certain matters mentioned in paragraph 7 of the official action as to claims 1, 3 and 23. These matters have been addressed. Support for the amendment to claim 23 is at page 4, lines 1-20, and page 15, lines 19-24. The claims are submitted to be definite within the meaning of §112, second paragraph. Withdrawal of the §112 rejection is requested.

The outstanding rejections based on art are as follows:

- (1) Claims 1-6, 10, 11, 16, 17, 21 and 23 under 35 U.S.C. §102(b) as anticipated by WO 97/27933 (Becker);
- (2) Claims 1-25 under 35 U.S.C. §103(a) as unpatentable over Becker; and
- (3) Claims 2, 3 and 25 under 35 U.S.C. §103(a) as unpatentable over Becker in view of WO 98/04355 (Pethig).

As to the rejection noted as (3) above, no claims are identified in paragraph 12 of the official action wherein the rejection is set forth. In the discussion of the rejection, claims 2, 3 and 25 are mentioned. Accordingly,

applicants have considered this rejection accordingly. It is noted that claims 1, 16, 22 and 23 are the only independent claims.

Becker is the sole or primary reference as to each rejection. Becker describes a method whereby a liquid containing suspended particles is caused to flow along a chamber containing a series of electrode elements. The electrodes are energized so as to impose either a stationary or a traveling wave dielectrophoretic force onto the suspended particles. Different particles are forced up to various heights above the electrode plane and into different parts of the velocity profile of the flowing liquid. As a result, different particles travel through the chamber at different velocities, so that they exit the chamber at characteristic positions in the eluted fluid.

The claimed invention is directed to a method for separating particles in a stationary fluid. Thus, the basic physics of operation of Becker teaches nothing about applicants' claimed methodology and apparatus.

In particular, important aspects to note regarding Becker are that (1) the method depends totally on establishing a well-defined fluid flow profile above the electrodes. For example, on page 16, lines 12-13, it is

stated: "The velocity of the different matter within the fluid is controlled by the velocity profile of the fluid". The method of field flow fractionation cannot work in a stationary fluid; and (2) all the particles travel along the chamber in the same direction (albeit at different velocities) determined solely by the direction of fluid flow.

The above can be contrasted with the following aspects of the claimed invention: (1) in the preferred operation the fluid is stationary in the chamber during the process of particle separation; and (2) in the preferred operation, separation of different particles involves different particles traveling in opposite directions to each other. The direction of travel of a particular particle type, for superposition of a set stationary field dielectrophoretic force onto a set traveling field dielectrophoretic force, is determined by the physicochemical (dielectric) properties of each particle type.

Becker does not teach a method for separating particles in a stationary fluid as claimed. Further, it is not possible to achieve applicants' separation method from the method of Becker.

The Examiner correctly states in paragraph 9, page 4 (lines 13-14) and paragraph 12, page 8 (lines 6-7), that "there inherently is a traveling wave dielectrophoretic window". Applicants' teach how this frequency window (meaning the range of frequencies where translational traveling motion occurs) can be extended or reduced, so as to enhance the separation of different particles. This is first described in the open literature in the paper by Pethig et al, entitled "Enhancing Traveling-Wave Dielectrophoresis With Signal Superposition", IEEE Eng. Med. Biol. Mag., volume 22 (part 6), pages 43-50, 2003 (copy attached). Becker does not teach the method described in this 2003 publication which, in fact, represents the subject of the captioned application (note: footnote 13 refers to the International application upon which the captioned application is based).

In paragraph 11, page 6 (lines 18-20) and in paragraph 12, page 8 (lines 18-19), the Examiner states that "the use of a third signal would have been within the skill of an artisan". Adding an extra signal to the electrodes is straightforward. Not so straightforward and, therefore, unobvious in view of the lack of teaching or suggestion, is knowing or determining what the frequency and magnitude of

this third signal should be in order to change the dielectrophoretic movement of a specific particle type in a stationary fluid. Becker does not teach this. Applicants thus submit it would not have been obvious to one of ordinary skill in the art at the time the invention was made to have varied the speed of the particles so that the particles could be separated.

Further, applicants do not agree with the Examiner's opinion, as stated in paragraph 12, page 9 (lines 14-19) that "However, as noted above, Becker et al teaches signals that range from 10 kHz to 10 MHz. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a first signal of 55 kHz for TWD and a second static DEP signal at a frequency of 55 kHz, whereby the TWD window extends between 10 kHz and 18 MHz, because such is within the scope of Becker's disclosure". Applicants respectfully submit that the Examiner is confusing the concept of a TWD signal and a TWD window. The TWD signal represents the frequency of the voltage signal applied to the electrodes, whereas the TWD window represents the frequency range over which a particle can be observed to move in a stationary fluid over the electrodes. A TWD signal may be applied at 55 kHz, but

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whether or not the particle is induced to move depends on whether or not the TWD window includes this frequency. Applicants' invention is directed to teaching how the TWD window can be changed so as to include (or exclude) any desired frequency. Applicants claimed invention provides for superimposing two or more different voltage signals to electrodes in order to produce particle separation in stationary fluids. Becker does not teach this.

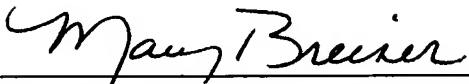
Accordingly, Becker does not teach each and every element as claimed by applicants. Thus, Becker does not anticipate the claimed invention under 35 U.S.C. §102. Further, Becker provides no suggestion of modifying the teaching of Becker so as to obtain applicants' claimed invention. Pethig does not make up for the shortcomings of Becker. Pethig is only relied on with regard to the additional claim limitation in dependent claim 25. Therefore, applicants respectfully submit that the claimed invention is not rendered obvious within the meaning of 35 U.S.C. §103. Withdrawal of the §102 rejections based on Becker and the §103 rejection based on a combination of Becker and Pethig is therefore respectfully requested.

Reconsideration and allowance of the application are respectfully urged.

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Respectfully submitted,

GARY LOCK ET AL

By   
Mary J. Breiner, Attorney  
Registration No. 33,161  
BREINER & BREINER, L.L.C.  
115 North Henry Street  
P.O. Box 19290  
Alexandria, Virginia 22320-0290

Telephone (703) 684-6885

Attachments - Proposed Corrected Figures 1 and 4  
- Article (IEEE Eng. Med. Biol. Mag.)